

Figure S1. The April 12 stratospheric O₃ intrusion as observed by the AIRS instrument aboard NASA Aqua satellite during ascending orbit (~1:30pm local time), showing total O₃ column (shading) in excess of 400-550 Dobson Units coinciding with 4-8 PVU of potential vorticity at 300 hPa (contours) computed from GFS FNL analysis.

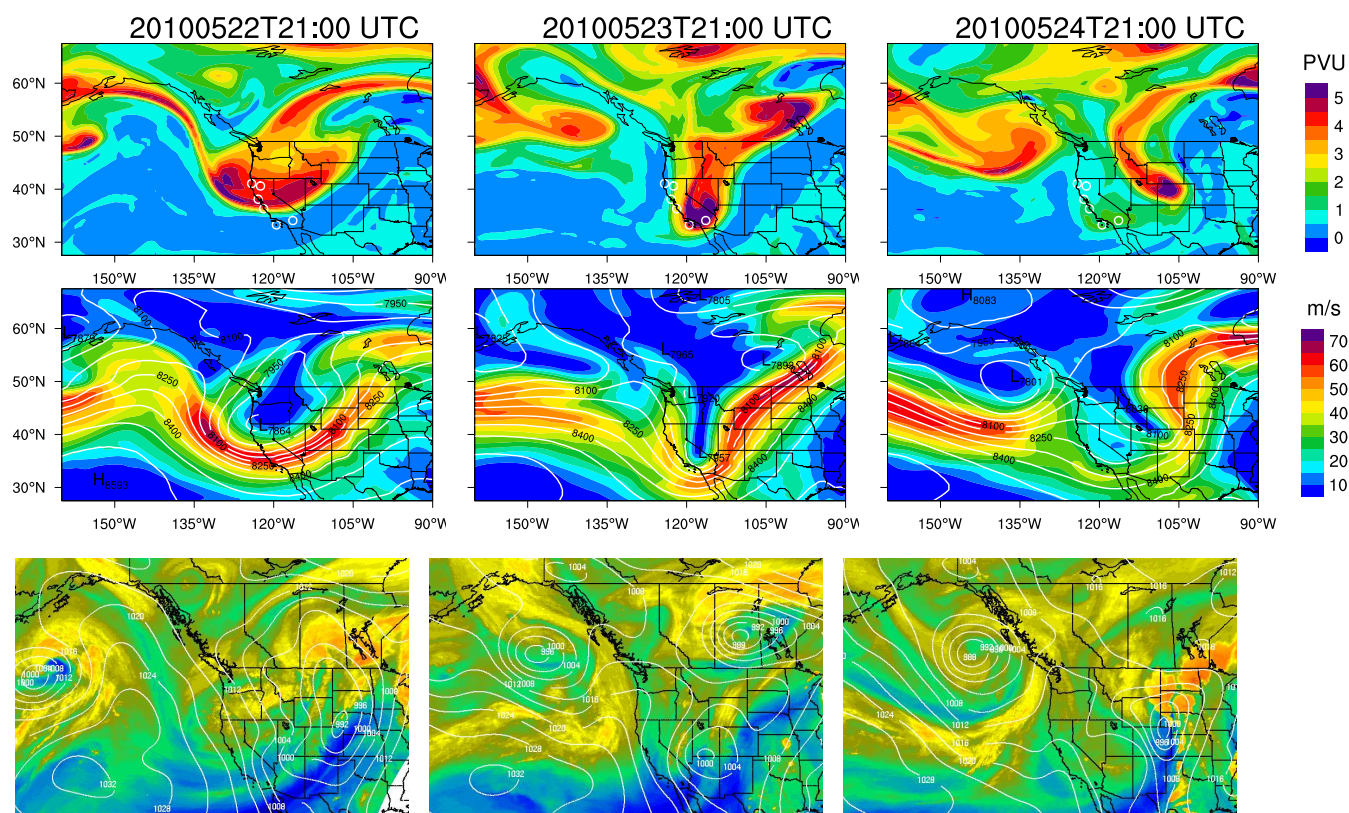


Figure S2. Synoptic conditions during the May 22-24 intrusion, showing propagation of an upper-level trough over the western United States: (top) AM3 250 hPa potential vorticity in PVU, (middle) AM3 250 hPa wind speed (shading) with 350 hPa geopotential height (contoured in gpm) from GFS FNL analysis, and (bottom) GOES-West water vapor images (with mean sea level pressure).

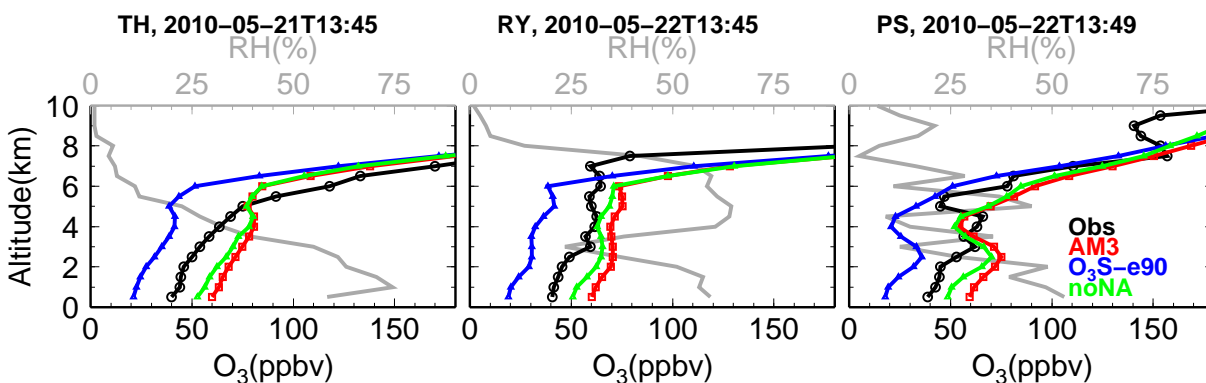


Figure S3. Same as Figure 3, but for May 21-22, showing penetration of a large tropopause fold to 6-8 km a.s.l. at the soundings located within the trough over Northern California (shown in the left panels of Figure S2).

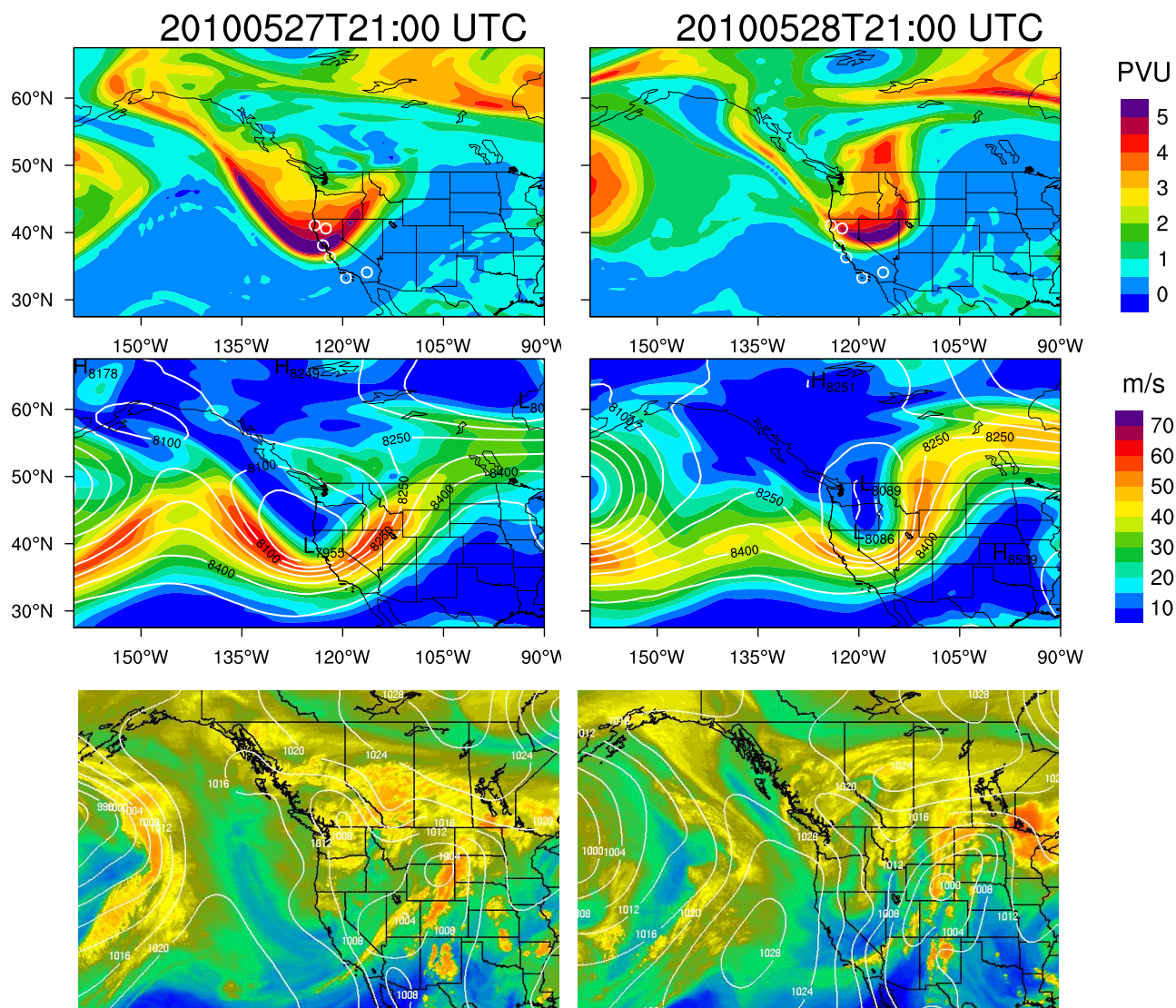


Figure S4. Same as Figure S2, but showing synoptic conditions for the May 27-28 intrusion.

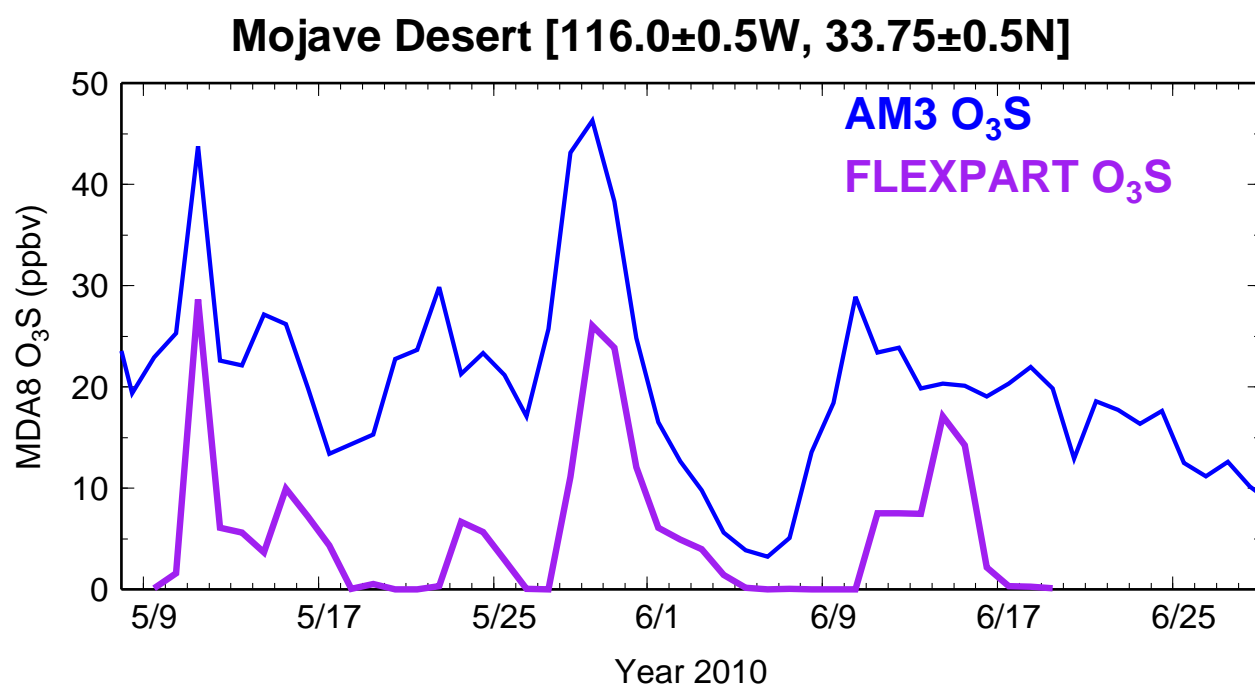
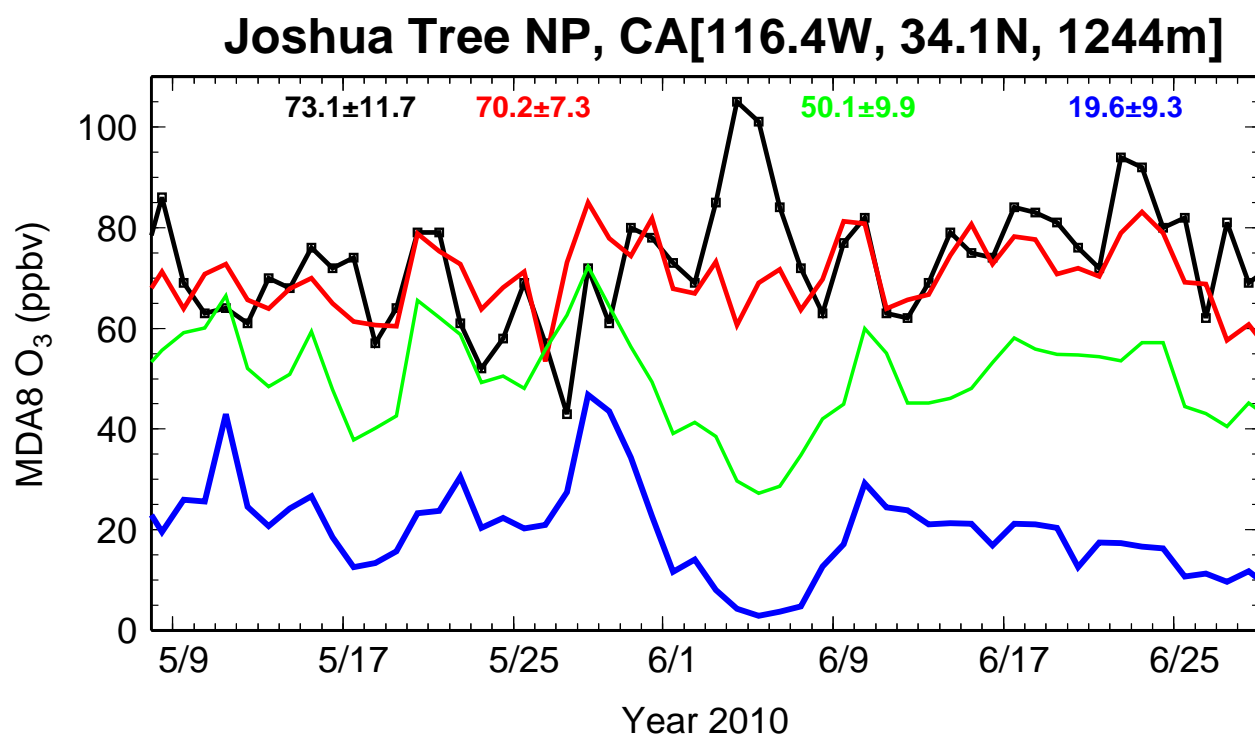


Figure S5. Stratospheric impacts on surface ozone over Southern California, showing (top) time series at Joshua Tree National Park (labels as Figure 11) and (bottom) comparison of AM3 and FLEXPART stratospheric O_3 tracers (Section 2.3) in surface air over the Mojave Desert from May 9-June 29, 2010. A higher concentration found in AM3 reflects the influence of background.

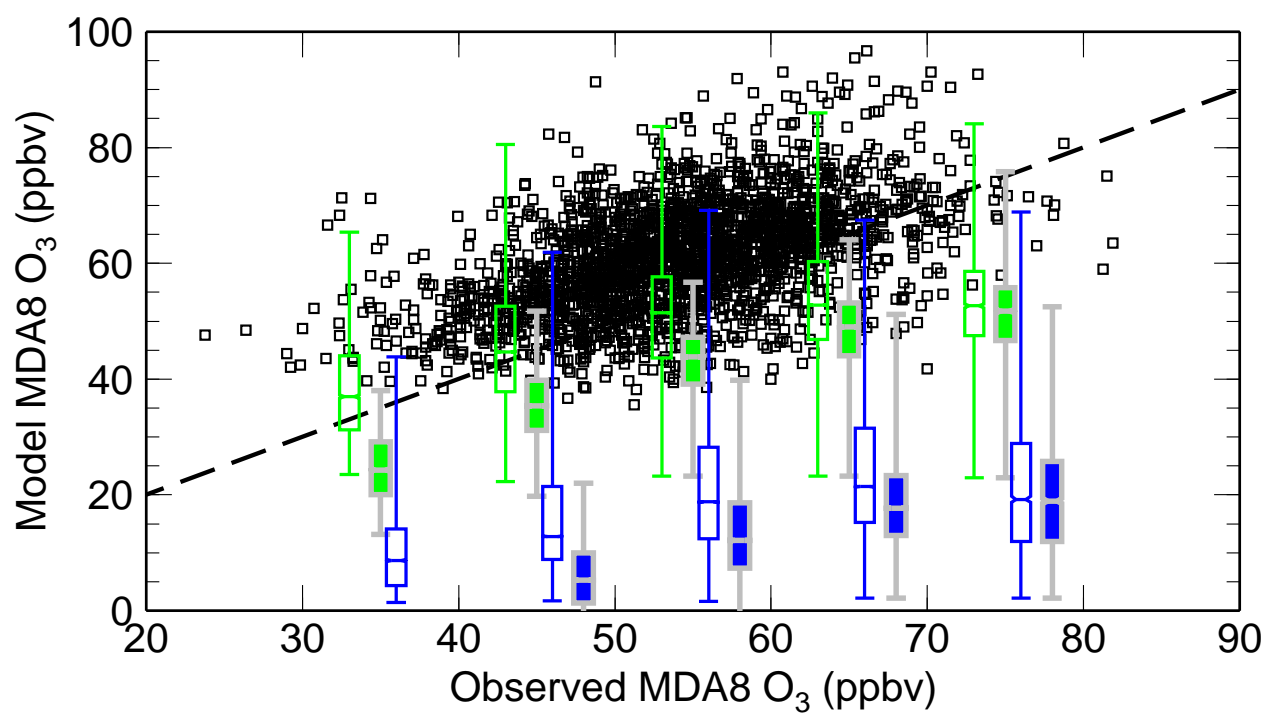
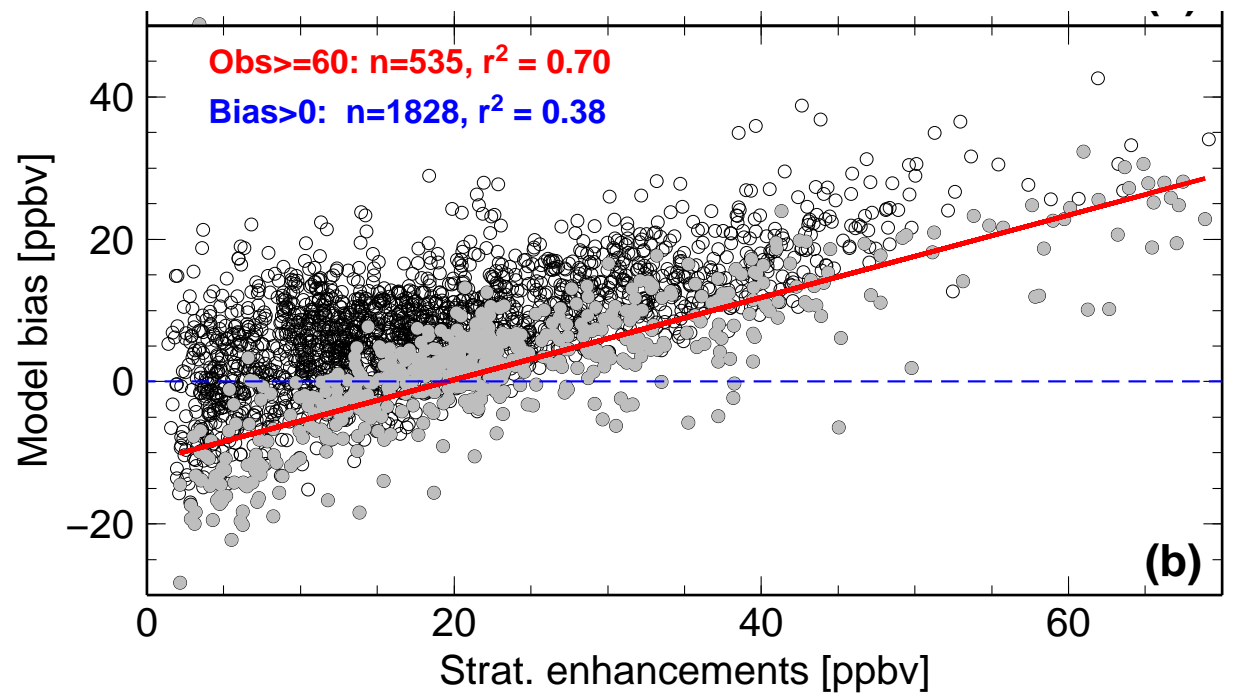


Figure S6. Same as (top) Figure 12 and (bottom) Figure 14, but for all AQS and CASTNet sites in Arizona, New Mexico, and Western Texas.

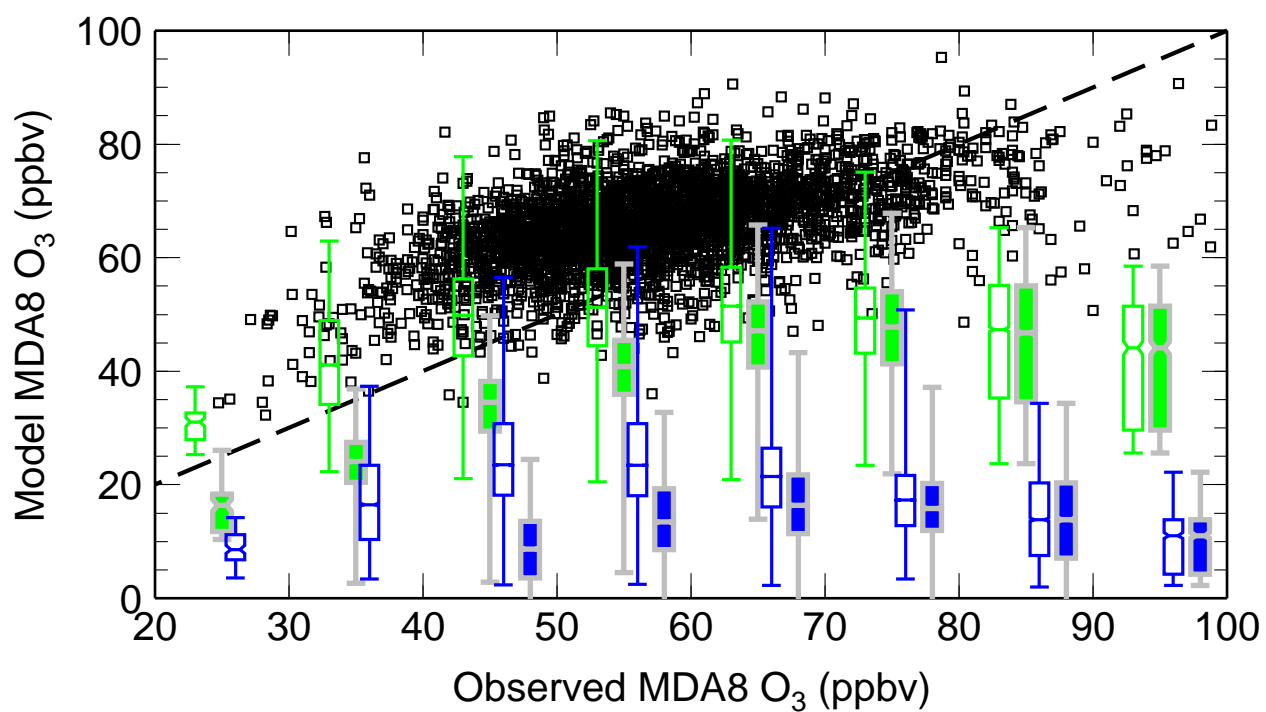


Figure S7. Same as Figure 14, but for polluted sites in the densely populated regions of Central Valley, Southern California, and Las Vegas, identified based on observed median MDA8 O₃ in April-June 2010 equal to or greater than 50 ppbv.